IN THE CLAIMS

Please amend the claims as follows:

Please cancel claims 1-31.

1-31 (cancelled)

Please add new claims 32-69.

32. (new) A method for estimating a property of a fluid, comprising:

(a) transmitting a first acoustic pulse in a first member that is in contact with the fluid;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.

33. (new) The method of claim 1, wherein the property of the fluid comprises one of acoustic impedance, density and viscosity of the fluid.

34. (new) The method of claim 1, further comprising:

estimating a reflection coefficient of the interface between the first member and the fluid.

35. (new) The method of claim 1, further comprising:

estimating an acoustic impedance of the first member.

36. (new) The method of claim 1, further comprising:

estimating a slope of energy decay for the plurality of acoustic pulse echo returns.

37. (new) The method of claim 5, wherein estimating the slope of energy decay comprises performing a least squares fit to the plurality of acoustic pulse echo returns.

38. (new) The method of claim 5, wherein estimating the slope of energy decay comprises dividing each of the plurality of acoustic pulse echo returns into a plurality of time windows.

39. (new) The method of claim 7, wherein estimating the slope of energy decay further comprises integrating over each of the plurality of time windows.

40. (new) The method of claim 5, wherein estimating the slope of energy decay further comprises subtracting noise from each of the plurality of acoustic pulse echo returns.

41. (new) The method of claim 1, further comprising:

transmitting a second acoustic pulse through the fluid; and

estimating speed of sound through the fluid, using round trip travel time for the second acoustic pulse between the first member and a second member that is in contact with the fluid.

42. (new) The method of claim 1, further comprising:

transmitting a second acoustic pulse through the fluid; and

estimating attenuation of the second acoustic pulse through the fluid.

43. (new) The method of claim 11, wherein estimating the attenuation includes estimating the attenuation at a plurality of frequencies.

44. (new) The method of claim 10, wherein transmitting the second acoustic pulse further comprises transmitting a plurality of acoustic pulses at a plurality of frequencies.

45. (new) The method of claim 1, wherein the method is performed downhole.

46. (new) An apparatus for estimating a property of a fluid, comprising:

a vessel that contains the fluid;

an acoustic pulser that transmits a first acoustic pulse into a first vessel member that is in contact with the fluid;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first vessel member and the fluid; and

a processor that estimates the property of the fluid from the plurality of acoustic pulse echo returns.

47. (new) The apparatus of claim 15, wherein the vessel comprises one of a flask, pipe, conduit, sample chamber, flow pipe, tube, channel, and downhole tool housing.

48. (new) The apparatus of claim 15, wherein the property comprises one of acoustic impedance, density and viscosity of the fluid.

49. (new) The apparatus of claim 17, wherein the processor estimates a reflection coefficient of the interface between the first vessel member and the fluid.

50. (new) The apparatus of claim 18, wherein the processor measures acoustic impedance of the first vessel member.

51. (new) The apparatus of claim 15, wherein the processor estimates a slope of energy decay for the plurality of acoustic pulse echo returns.

52. (new) The apparatus of claim 20, wherein the processor performs a least squares fit to the plurality of acoustic pulse echo returns.

53. (new) The apparatus of claim 20, wherein the processor divides each of the plurality of acoustic pulse echo returns into a plurality of time windows to reduce noise.

54. (new) The apparatus of claim 22, wherein the processor integrates over each of the plurality of time windows.

55. (new) The apparatus of claim 20, wherein the processor estimates the slope of energy decay from a value adjusted for noise for each of the plurality of acoustic pulse echo returns.

56. (new) The apparatus of claim 15, wherein the acoustic pulser transmits a second acoustic pulse through the fluid and the processor estimates the speed of sound through the fluid using the round trip travel time for the second acoustic pulse between the first vessel member and a second member that is in contact with the fluid.

57. (new) The apparatus of claim 15, wherein the acoustic pulser transmits a second acoustic pulse through the fluid and the processor estimates attenuation of the second acoustic pulse through the fluid.

58. (new) The apparatus of claim 26, wherein the processor estimates the attenuation at a plurality of frequencies.

59. (new) The apparatus of claim 25, wherein the acoustic pulser transmits a plurality of pulses at a plurality of frequencies.

60. (new) The apparatus of claim 15, wherein the apparatus is located downhole.

61. (new) A method for estimating a property of a fluid, comprising:

(a) generating a first acoustic pulse in the fluid that is in contact with a first member;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.

62. (new) An apparatus for estimating a property of a fluid, comprising:

a chamber that contains the fluid;

a transmitter that sends a first acoustic pulse into the fluid that is in contact with a first chamber member;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first chamber member and the fluid; and

a processor that estimates the property of the fluid using the plurality of acoustic pulse echo returns.

63. (new) A downhole tool which is deployed in a borehole for estimating a property of a downhole fluid, comprising:

a vessel that contains the fluid;

an acoustic pulser that transmits a first acoustic pulse into a first vessel member that is in contact with the fluid;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first vessel member and the fluid; and

a processor that estimates the property of the fluid using the plurality of acoustic pulse echo returns.

64. (new) The downhole tool of claim 32, wherein the vessel comprises one of a flask, pipe, conduit, sample chamber, flow pipe, tube, channel and downhole tool housing.

65. (new) The downhole tool of claim 33, wherein the property comprises one of acoustic impedance, density and viscosity of the fluid.

66. (new) The downhole tool of claim 34, wherein the processor estimates a reflection coefficient of the interface between the first vessel member and the fluid.

67. (new) The downhole tool of claim 32, wherein the processor estimates a slope of energy decay for the plurality of acoustic pulse echo returns.

68. (new) The downhole tool of claim 36, wherein the processor performs a least squares fit to the plurality of acoustic pulse echo returns.

69. (new) A method for estimating a property of a fluid, comprising:

(a) generating a first acoustic pulse in a first member that is in contact with the fluid;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.